

# Vitamin D in midlife: The sunrise vitamin in the sunset of life

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## ABSTRACT

With significant increase in ageing populations and life expectancies worldwide; the recent resurgence of the health problems associated with vitamin D inadequacy; and the role that vitamin D inadequacy might play in other chronic diseases, concern regarding inadequate vitamin D levels has emerged into the forefront of medicine.

**Key Words:** Menopause, osteoporosis, vitamin D

## INTRODUCTION

Life expectancies are increasing. Along with this is the significant increase in the ageing populations worldwide. In addition, there has been a recent resurrection of health problems associated with vitamin D inadequacy. Therefore, concerns regarding inadequate vitamin D levels have emerged into the forefront of medicine and thus into midlife. In the light of medical evidence available today, the healthcare providers to midlife women need to keep in mind vitamin D while caring for this subset of women. This little wonder of a vitamin is supposed to play a central role in many activities of the body processes and is on the A-list for menopausal women. Numerous published studies have concluded that vitamin D might play a role in preventing many diseases, from cancer and cardiovascular disease to osteoporosis, Alzheimer's, diabetes, depression, immune function and weight gain. It is one of those multitasking vitamins that can act as a preventive for many diseases. Experts agree that vitamin D is essential for good health and wellness. However, half of the women in their midlife have vitamin D deficiency, and hence do not benefit from it. That said, there is no consensus about what is enough and how people should go about getting enough. The Sunshine vitamin: There are 2 major forms of vitamin D: Vitamin D2 and vitamin D3. Both these vitamins, when ingested undergo metabolism in the liver to form 25-hydroxyvitamin D (25(OH) D (D represents either D2 or D3)) and in the kidneys to 1, 25-dihydroxyvitamin D.

Both vitamin D2 and vitamin D3 are available in supplements. Vitamin D is also known as the "sunshine vitamin" because the body manufactures the vitamin after being exposed to sunshine. When humans are exposed to sunlight, 7-dehydrocholesterol in the skin absorbs ultraviolet-B (UVB) (290-315 nm) radiation resulting in the production of vitamin D3.<sup>[1]</sup> The major source of D3 is cutaneous synthesis requiring sunlight exposure; other sources include gastrointestinal absorption of foods such as fatty fish (e.g., salmon), cod liver oil, eggs and milk. However, many people living in sunny climates still do not make enough vitamin D and need more from their diet or supplementation. This could be partly due to the use of sunscreens and spending more time indoors. Obesity, malabsorption syndrome, use of anticonvulsants, antiretrovirals, or various other medications, and skin aging have been associated with low serum 25(OH) D levels. How much is enough? Vitamin D serum levels can be measured to determine vitamin D stores. The value that is measured is 25(OH) D.<sup>[1,2]</sup> It represents the combined contributions of cutaneous synthesis and oral ingestion of the dietary sources of vitamin D, including vitamin D2 from plants and fungi and vitamin D3 from animal sources, fortified foods, and supplements. This compound has the longest half-life and is considered the correct functional indicator of vitamin D stores in humans. Its optimal levels range

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from 30 to 90 ng/mL (75-225 nmol/L). However, different countries vary in their recommendations concerning optimal vitamin D levels. Factors affecting vitamin D levels include season of the year (lower in the winter), latitude, altitude, air pollution, skin pigmentation, and skin coverage by clothing. Hypovitaminosis D can be in the form of vitamin D insufficiency, vitamin D deficiency, and severe deficiency of vitamin D, based on the respective cutoff values of 25(OH) D levels of 20-29.99 ng/mL, below 20 ng/mL, and below 10 ng/mL. Vitamin D deficiency symptoms may be silent, or symptomatic with muscle and joint pains, fractures, fatigue, lowered immunity, periodontal disease, obesity, depression, mood swings, sleep irregularities, and dementia. Vitamin D and midlife: Menopause is an important phase in women's life, which triggers various health problems. As menopause approaches and a woman's estrogen levels begin to decline, it is particularly important for women to ensure they are getting enough vitamin D, as well as calcium. The reason is that daily dose of calcium requirement becomes higher during menopause, from 1000 milligrams for women up to age 50 years to 1,500 milligrams for older women. Getting enough vitamin D is essential for menopausal women to effectively use dietary calcium to maintain bone strength and help prevent osteoporosis. Analysis of diet pattern of peri- and postmenopausal women in the western world shows an inadequate intake of vitamin D. However, in India there have been very few studies on this. Healthy postmenopausal women may achieve adequate serum concentrations by sunlight, diet, and supplements. A practical and common recommendation for adequate vitamin D from sunlight is 5 to 15 min of sun exposure from the hours of 10 am to 3 pm in the spring, summer, and autumn at least 2 times per week to the face, arms, hands, or back. Dietary sources, which are not as significant as cutaneous synthesis, include animal-based foods such as fatty fish, eggs, and milk. The daily requirement of menopausal women is 600 international units (IU) of vitamin D, which is the daily recommendation for all adults, including women aged 19 to 70 years. After age 70 years, women need 800 IU each day. To achieve these adequate levels, women with low serum 25(OH) D may require doses ranging from 4000 to 10,000 IU/day. These recommendations are based on the assumption that dietary calcium intakes are adequate, as low dietary calcium intakes may increase vitamin D requirements. Dietary sources of vitamin D can be from plants (ergocalciferol or vitamin D<sub>2</sub>) or animals (cholecalciferol or vitamin D<sub>3</sub>). Supplements can come from either source. A review of the medical and lay press appears to conclude that vitamin D<sub>2</sub> is less effective than vitamin D<sub>3</sub> in maintaining vitamin D status. However, a recent placebo-controlled study concluded that 1000 units of vitamin D<sub>2</sub> daily was as effective as 1000 units of vitamin D<sub>3</sub> in maintaining serum 25-hydroxyvitamin D

levels.<sup>[3]</sup> Therefore, vitamin D<sub>2</sub> and D<sub>3</sub> supplements may be considered comparable and possess equal potency. Vitamin D is an important nutrient to maintain of bone health. Vitamin D has been extensively studied regarding its impact on fracture risk reduction. In fact, vitamin D deficiency has been associated with a greater incidence of hip fracture in many populations, including postmenopausal women.<sup>[4]</sup> Le Boff *et al.*, found that almost 50% women with osteoporosis who were hospitalized due to hip fractures, 50% had signs of vitamin D deficiency.<sup>[5]</sup> The primary functions of vitamin D are the regulation of intestinal calcium absorption and the stimulation of bone resorption leading to the maintenance of serum calcium concentration. The majority of our population does not get adequate vitamin D levels. In fact, it is estimated that 90% of adults between 51 and 70 years of age do not get enough vitamin D from their diet. Another meta-analysis of randomized, controlled fracture prevention trials with vitamin D reported that oral vitamin D supplementation between 700 and 800 units per day appeared to reduce the risk of hip and any non-vertebral fractures in ambulatory or institutionalized elderly persons. An oral vitamin D dose of 400 IU/d was not sufficient for fracture prevention.<sup>[6]</sup> A cochrane database review reported that vitamin D alone showed no statistically significant effect on hip fracture, vertebral fracture, or any new fracture. Vitamin D with calcium marginally reduced hip fractures and non-vertebral fractures; however there was no evidence of the effect of vitamin D with calcium on vertebral fractures. Further investigation regarding the dose, frequency, and route of administration of vitamin D in older people was recommended.<sup>[7]</sup> The vitamin D Individual Patient Analysis of Randomized Trials (DIPART) Group has recently published an analysis using pooled data from 68,500 participants from seven major randomized, vitamin D fracture trials in the USA and Europe.<sup>[1]</sup> The results showed that vitamin D alone in doses of 10-20 µg (400-800 IU) was not effective in preventing fractures. On the other hand, vitamin D given with calcium showed a reduced overall risk of fracture (hazard ratio 0.92, 95% confidence interval 0.86-0.99; *P* = 0.025). Although, supplementation with vitamin D and calcium has been shown to reduce fracture rates in the institutionalized elderly, there remains controversy as to whether supplementation is effective in reducing fracture in free-living populations.

Epidemiologic studies of the association between vitamin D and breast cancer risk have had conflicting results. Although several studies have suggested an inverse association between vitamin D intake and the risk of breast cancer, others have shown no association. In the Women's Health Initiative, calcium plus vitamin D supplementation for an average of 7 years did not reduce the incidence of invasive breast cancer and colorectal cancer when

compared with placebo. There is a need for well-designed clinical trial of optimal administration of vitamin D as a cancer therapy. With a word of caution: With so much said about vitamin D deficiency and insufficiency, one must be careful not to overenthusiastically over-treat vitamin D deficiency without actually monitoring vitamin D levels and land up with hypervitaminosis D. Hypercalcemia, constipation, decreased appetite, lethargy, dehydration, polyuria, polydipsia, nausea, vomiting, abdominal pain, nephrocalcinosis and headache can be the common clinical features of hypervitaminosis D. Hypercalciuria due to excessive vitamin D intakes is always accompanied by circulating 25(OH) D concentrations >100 ng/mL. To attain circulating 25(OH) D concentrations that exceed 100 ng/mL, a daily vitamin D intake well in excess of 10 000 IU/d (250 µg/d) for several months would be required. However, hypervitaminosis D has never occurred when physiologic amounts of vitamin D are ingested. In addition, no case of hypervitaminosis D from sun exposure has ever been reported. There is widespread prevalence of varying degrees (50-90%) of vitamin D deficiency with low dietary calcium intake in the Indian population according to various studies published earlier.<sup>[8,9]</sup> Marwaha *et al.*, have reported vitamin D deficiency in healthy Indians above 50 years from north India.<sup>[10]</sup>

## CONCLUSION

Although, there is adequate sunshine in India, high temperatures during the daytime and humid climate in many areas are the deterrents to follow the advice about sun exposure. Hence, food fortification and public health policies for vitamin D supplementation and dietary guidelines for adequate calcium for the Indian population should be formulated and implemented. In light of all the controversy and the absence of consensus, it is better to preach moderation. It is said that “Prevention is better

than cure”. This is true for vitamin D insufficiency and deficiency which are easily preventable. Thus, the current recommendations of including 1-1.5 gm of dietary calcium and 800 IU of vitamin D per day in the diet for women in her midlife should be adhered to avoid vitamin D deficiency in India. The sunshine vitamin has the potential to bring a new sunshine in the sunset of women’s lives!

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